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ABSTRACT

Despite the apparent influence of marriage and childbearing on women's educational outcomes, these variables generally have not been included in models of educational attainment. To investigate the factors associated with the educational attainment of a national sample of young women drawn from the Project Talent Data Bank, the effects of family of origin, school-related variables, adolescent achievement expectations, and age at marriage were assessed, with a focus on the relationship between educational attainment and fertility. Results indicated that the responsibilities of childrearing attenuated women's educational achievements. Each child was estimated to cost a woman approximately .8 to 1.5 years of education. The effect of level of education on fertility was statistically insignificant. Because number of children was the single most important predictor of women's educational attainment, the trend of postponing childbearing and having smaller families may result in more women continuing their education beyond high school. (Author/NRP)

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Women's Educational Attainment and Fertility

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Women's Educational Attainment and Fertility

Recent concern with the economic status of women has stimulated considerable interest in the nature of women's achievement patterns in comparison to those of men (e.g., Alexander & Eckland, 1974; Hoffman, 1975; Marini, 1978; Sewell & Shah, 1967, 1968; Stein & Bailey, 1973; Treiman & Terrell, 1975). Statistics regarding educational achievement indicate, for example, that while men and women in the U. S. acquire about the same median level of education, 12.5 and 12.3 years, respectively (U. S. Bureau of the Census, 1977), their educational experiences differ in important respects. For one thing, males and females tend to specialize the different fields. Perhaps more important, females are much more likely to terminate their formal educational training before graduating from college. Only 11.3% of the women in the U. S. obtained four or more years of college in 1976. The corresponding figure for men is 18.6% (U. S. Bureau of the Census, 1977).

Explanations for sex differences in socioeconomic achievements, such as educational attainment, often emphasize the importance of marriage and family contingencies for women's choices and motivation (Ginzberg,

Ginsburg, Axelrad, & Herman, 1951; Psathas, 1968; Angrist & Almquist, 1975; Feldman, 1975; Havens, 1975). Human capital economists maintain, for example, that "investment" in education may be less "profitable" for women than it is for men, since marriage and childrearing responsibilities make women's labor force participation less predictable (Kreps, 1971). Along somewhat different lines, psychologists such as Angrist and Almquist (1975) have stressed the difficult psychological dynamics associated with women's attempts to "juggle" career-family contingencies. Indeed, the fact that women are responsible for the bulk of household chores, irrespective of their other responsibilities (Feldman, 1975; Vanek, 1978), leads one to expect considerable conflict between their roles as spouse, parent, and student.

In spite of the apparent importance of marriage and childbearing for women's educational outcomes, these variables generally have not been included in models of educational attainment. Furthermore, the first attempts to quantify the effects of marriage and family-formation events have focused on males (Call & Otto, 1977; Duncan, Featherman, & Duncan, 1972).[1] This deficiency in previous research has been addressed by several recent investigations which assess the effect of age at birth of first child (Waite & Moore, 1978) and age at marriage (Alexander &

Eckland, 1978; Marini, 1978) on women's educational attainment. The results of these studies suggest that family-formation contingencies, such as the timing of marriage, both influence and are influenced by women's educational outcomes. Waite and Moore (1978), for example, find that a woman's age at the birth of her first child is strongly and positively related to her educational attainment even after other variables are controlled.[2] Furthermore, in terms of educational attainment, early childbearers do not catch up with their peers who postpone childbearing.[3] Alexander and Eckland (1978) and Marini (1978) both find that while marital responsibilities influence the amount of education a woman receives, her level of education affects the age at which she marries to an even greater extent. These studies highlight the importance of modifying previous causal models so that they more accurately represent women's achievement processes.

To date, researchers have not examined the causal relationship between women's educational attainment and fertility. As can be seen in Table 1, census statistics show a definite negative relationship between women's level of education and their number of children. This relationship exists across age levels. Of course, the causal explanation for this relationship is unclear. While it has been claimed

Table 1

Mean Number of Children Born to Ever-Married Women by Age and Educational Level: 1974

Educational Level	Age		
	15-24	25-34	35-44
8 years	1.5	3.0	3.7
12 years	.8	2.0	3.0
13-15 years	.4	1.7	2.8
16 or more	.2	1.2	2.4

Source: U. S. Department of Commerce, Bureau of the Census, Current Population Reports, Special Studies Series P-23, No. 58, 1976.

that education operates as a deterrent to fertility in that it enables women to obtain more satisfying jobs and it serves to delay the time of marriage and the birth of children (Hoffman, 1975), the reverse direction of causality is also plausible. That is, the observed negative relationship between family size and education may be due to the considerable demands of maternity interfering with women's academic achievement.

This paper investigates the factors underlying the educational attainment of a national sample of women. The importance of family of origin, schooling-related variables, adolescent achievement expectations, and age at marriage are assessed. Most important, the study explores the causal relationship between women's educational attainment and fertility in an attempt to determine whether these outcomes mutually influence each other or whether the effects of one dominate the other.

Sample Description

The data for this study come from the Project Talent Data Bank. Project Talent is a large-scale educational study whose general goal is to examine the nature and development of the abilities of high school students in the United States.

In methodology, Project Talent is both cross-sectional and longitudinal. That is, students in grades 9 through 12,

first studied in 1960, are followed-up aperiodically. For the original survey in 1960, Project Talent administered a battery of tests and questionnaires to over 400,000 students representing a stratified random sample of high school students in the U.S.[4] Approximately 1/4 of these students (92,272) were in the eleventh grade. The schools taking part in the survey constituted a 4-1/2% sample of all high schools (public, private, and parochial) in 1960.

In 1972, eleven years after students were to have graduated from high school, follow-up questionnaires were sent to 91,602 of the eleventh grade sample (the remainder were deceased or had asked Talent to remove their names from the mailing list). Of this group, about 25% (22,968) responded. Talent undertook an intensive follow-up of a 3.57% sample of the nonrespondents and obtained a response rate of 83%. The total eleventh grade sample, from which the sample of women used in this study is drawn, consists of these successfully contacted nonrespondents plus a random 3.61% of the individuals who returned the questionnaires initially. Of these 2,906 persons, 1,479 are female. These women constitute the basic sample for this study. However, the analyses which follow are based on a subsample of ever-married women with data on all variables used in the analyses.

Table 2 presents some comparative data on Project Talent women and young U. S. women in 1971. The data on family size indicate that Talent women are quite similar to young women in the U.S. at that time in terms of fertility. Furthermore, many of Talent's married women have probably completed their families. In 1969, women with 1-3 years of college (this sample's mean years of education is 13.25) each had about 2.1 children (U. S. Bureau of the Census, 1972).

Regarding labor force participation, the statistics indicate that 47% of the entire sample is in the labor force on a part-time or full-time basis in 1972. This compares quite favorably with Census figures which show that 45.5% of women ages 25-34 participated in the labor force in 1971. On the average, those who work do so about 36 hours a week, 43 weeks a year, for a mean annual earnings of about $6,000. Considering their young age and the fact that some are part-time workers, these earnings are relatively high and are probably attributable to the fact that the sample has at least 11 years of education. The Census reports that the median annual earnings of year-round full-time female workers in 1971 was about $5,600.

These statistics suggest that in terms of labor force participation and fertility, the Talent sample appears to be

Table 2

Comparison of Project Talent Women With Young U. S. Women in 1971

Characteristic	Talent	U. S.
Number of children	1.88[1]	1.95[2]
In the labor force	47%	45.5%[3]
Annual earnings[4]	$6,000	$5,600
Completed 4 or more years of college	20.8%	16.9%

[1]Born to ever-married Talent women.

[2]Born to ever-married 25-29 years old women in 1971. Source: U. S. Bureau of the Census, 1972.

[3]Based on 25-34 years old women in 1971. Source: U. S. Bureau of the Census, 1972.

[4]Talent figure is the mean earnings of part-time and full-time workers. U. S. figure is for year-round full-time female workers in 1971. Source: U. S. Bureau of the Census, 1972.

fairly representative of young U. S. women in 1971. This is in spite of their moderate educational advantage and the fact that 93% of the sample is white.

The data have several limitations. First, the final sample of 2,906 individuals is only 3% of the original 92,272 students. This could reduce one's ability to generalize the results, however the follow-up procedures should insure that the sample is representative of the original group.

Second, since all respondents have had at least 11 years of education, poorly educated women are underrepresented as are women with very low academic ability. This may attenuate the relationships between education and other variables.

Third, the women are only about 28 years old at the time of the follow-up. Thus, the effects of variables may change as the women age and the results may only reflect relationships early in women's life cycle.

Fourth, since the women in this sample were surveyed in 1960 and 1972, their outcomes were probably affected rather minimally by the feminist movement. Thus, one might reasonably expect a different pattern of results with a later cohort of women. Nevertheless, the results should be interesting in terms of the light they shed on the achievement processes of women in this historical period.

In spite of these shortcomings, the Project Talent data set is a rich source of information regarding the family background, schooling experiences, personal characteristics, and adult achievements of American students.

The Model

Figure 1 diagrams the model hypothesized to underly women's educational attainment and family-formation outcomes. The key feature of this model is that these events are conceptualized to be reciprocally-related to one another. Thus, in addition to specifying education and fertility to be a function of events occurring earlier in life, the model permits these outcomes to mutually influence each other.

The empirical model for the analysis can be formalized as follows:

$$\text{Years of Education} = f\ (\text{Socioeconomic Background, Academic Ability, Curriculum, Peer Influence, Marital Expectations, [Age at Marriage], Number of Children}) \quad (1)$$

$$\text{Number of Children} = f\ (\text{Socioeconomic Background, Academic Ability, Family Size Expectations, Age of Marriage, Years of Education}) \quad (2)$$

where the variables are measured as follows:

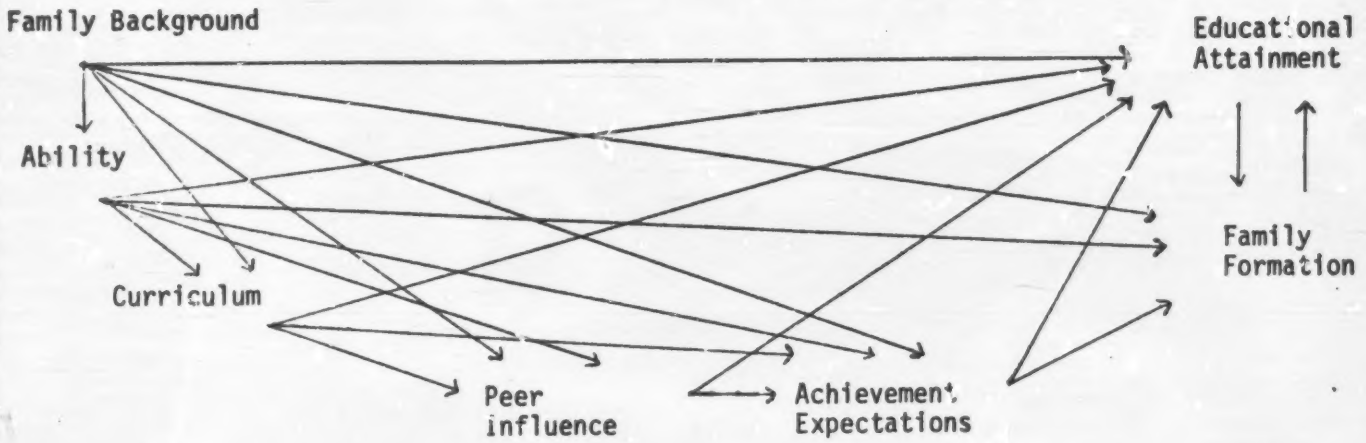

Figure 1. Non-Recursive Model of Educational Attainment

Years of Education	=	Years of Education woman has attained by 1972.
Socioeconomic Background	=	Talent's Index of Socioeconomic Status of the family of origin. Measured in 1960. $\bar{X}$ = 100, SD = 10.
Academic Ability	=	Talent's general academic aptitude composite, with $\bar{X}$ = 100 and SD = 15. Measured in 1960.
Curriculum	=	Dummy variable; coded 1 if girl is in an academic curriculum in 1960, 0 otherwise.
Peer Influence	=	Years of education a girl expects her friends will receive. Measured in 1960.
Marital Expectations	=	Age at which girl expects to marry. Measured in 1960.
Family Size Expectations	=	Number of children girl expects to have. Measured in 1960.

Age at Marriage = Age at which woman first married. Measured in 1972.

Number of Children = The number of children a woman had by 1972.

With the exception of marital and fertility expectations, age at marriage, and number of children, the variables included in the educational attainment equation (Equation 1) are ones frequently found in status attainment models (e.g., Alexander & Eckland, 1974; Marini, 1978; McClendon, 1975; Treiman & Terrell, 1975). Positive signs are expected for socioeconomic background, academic ability, curriculum, and peer influence since these variables proxy the resources (financial and academic) and other forms of encouragement which facilitate educational achievement.

While other researchers have investigated the relationship between educational expectations and educational attainment (e.g., Alexander & Eckland, 1974; Marini, 1978), the relationship between women's expectations regarding age at marriage and their educational outcomes has not yet been assessed. Such expectations have been hypothesized to be key determinants of decisions to invest in education (Mincer & Polachek, 1974). Indeed, on the basis of their interviews with women, Ginzberg, et al. (1951) reported that women who are primarily interested in

marriage are not inclined to invest much in preparation for work. In order to estimate the impact of this variable, a measure of adolescent expectations regarding the timing of marriage is included in the model.[5] A positive sign is expected.

The appropriate specification of Equation 1 with respect to the variable age at marriage, was unclear. A priori expectations are that the timing of marriage could influence educational attainment and some research indicates that this is the case (Alexander & Eckland, 1978; Marini, 1978); however, other analyses have been unable to replicate this finding (Abrams, 1980). Therefore, two specifications of the educational attainment equation are estimated, one in which age at marriage is not included (Model 1, Table 3) and one in which it is (Model 2, Table 3).

Finally, the number of children a woman has is included in Equation 1 in order to assess whether childrearing responsibilities interfere with women's educational accomplishments. A negative sign is expected for this variable.

The number of children equation (Equation 2) specifies family size to be a function of a set of variables which reflect preferences regarding family size (socioeconomic background,[6] children expected, and educational attainment)

efficacy in controlling family size (ability), and time constraints (age at marriage). Negative signs are expected for all variables except family size expectations, for which a positive sign is anticipated. It is assumed that curriculum, peer influence, and marital expectations affect family size only indirectly through their effects on educational attainment and its effect on family size. Thus, they do not appear in Equation 2.

Analysis

The method of analysis employed in this study is commonly used by economists and sociologists to analyze models for which the direction of causation cannot be assumed to be one-way. Since ordinary least squares regression is invalid in these cases, because the error term is correlated with an explanatory variable, parameters for such non-recursive models are estimated using two-stage least squares analysis (Duncan, 1975; Heise, 1975). Essentially, the two-stage least squares method involves using instrumental variables in the first stage of a multiple regression analysis to calculate predicted values for the jointly dependent variables which are uncorrelated with the error term. These unbiased predicted values are then used in a second stage regression analysis to estimate the parameters of the model.[7]

A typical concern in least squares estimation procedures is that of identification. That is, in order to obtain a unique solution for unknown parameters, the method requires that the number of equations available to estimate the parameters of the model must equal or exceed the number of parameters to be estimated. In Model 1, both equations are overidentified. In Model 2, the number of children equation is overidentified and the educational attainment equation is exactly identified. For this study, the SYSREG procedure of the SAS Program (Barr, Goodnight, Sall, & Helwig, 1976) is used.

Results

Table 3 shows the means and standard deviations for all variables in the analyses. Among other things, these data indicate that about 41% of the sample was in an academic curriculum in high school. On the average, the girls expected to marry at age 21 and have about 3 children. Their peers expected to obtain about 14 years of education. By age 28, the women had received 13 1/3 years of education and they had an average 1.88 children. The average age at marriage was almost 21.

Table 4 shows the correlations among the variables in the study. In general, the signs are in the expected directions. The one somewhat surprising finding is the

Table 3

Means and Standard Deviations for all Variables Used in the Analyses (N=746)

Variable	$\bar{X}$	SD
Socioeconomic background	100.07	9.37
Curriculum	.41	.49
Academic Ability	103.84	12.55
Peer Influence	14.20	1.89
Marital Expectations	21.06	2.20
Family Size Expectations	3.07	1.12
Age at Marriage	20.70	2.54
Number of Children	1.88	1.13
Years of Education	13.34	1.94

Table 4

Correlations of Variables Used in the Analyses (N=746)

Variable	Socio-economic Back-ground	Curriculum	Academic Ability	Peer Influence	Marital Expect.	Family Size Expect.	Age at Marriage	Number of Children	Years of Education
Socioeconomic Background	--	.41	.38	.33	.17	.11	.16	-.14	.44
Curriculum		--	.55	.42	.32	.13	.26	-.20	.58
Academic Ability			--	.40	.29	.13	.24	-.25	.51
Peer Influence				--	.28	.10	.24	-.18	.44
Marital Expectation					--	.04	.32	-.20	.31
Family Size Expectation						--	.05	.06	.02
Age at Marriage							--	-.47	.38
Number of Children								--	-.31
Years of Education									--

positive, though low, correlations between family size expectations and such variables as socioeconomic background, curriculum, ability, and peer influence. Since these latter variables are generally positively related to educational attainment, one would have expected their relationships to fertility expectations to be negative. This finding may indicate that adolescent females do not yet see a conflict between family contingencies and educational accomplishment.

Table 5 shows the estimates of both specifications of the educational attainment-number of children model. The results indicate that ability, adolescent expectations regarding family size, and age at marriage significantly affect the number of children a women has at 28. The standardized coefficients reveal that age at marriage is the most important determinant of family size. This is not surprising since women who married earlier started their families sooner (the correlation between age at marriage and age at first birth is .73). Obviously, this relationship may change as the women age and those having their children later in life complete their families. Somewhat surprisingly, socioeconomic background and educational attainment are found to have no net impact on family size. These results are virtually identical in both models.

Table 5

Estimates of Two Simultaneous Equation Models with Years of Education and Number of Children as Dependent Variables (N=746)[1,2]

	Model 1				Model 2			
	Number of Children		Years of Education		Number of Children		Years of Education	
Variable	B (S.E.)	β	B (S.E.)	β	B (S.E.)	β	B (S.E.)	β
Socioeconomic Background	-.00 (.01)	-.00	.03*** (.01)	.14	-.00 (.01)	-.00	.03*** (.01)	.14
Curriculum	--	--	1.20*** (.15)	.30	--	--	1.19*** (.18)	.29
Academic Ability	-.01* (.00)	-.11	.01** (.00)	.06	.01* (.00)	.11	.01 (.01)	.06
Peer Influence	--	--	.13*** (.04)	.12	--	--	.12** (.04)	.11
Marital Expectations	--	--	.02 (.03)	.02	--	--	.01 (.04)	.01
Family Size Expectations	.10** (.03)	.09	--	--	.09** (.03)	.08	--	--
Age at Marriage	-.18*** (.02)	-.40	--	--	-.18*** (.02)	-.40	-.12 (.12)	-.15
Number of Children	--	--	-.83*** (.13)	-.48	--	--	-1.46* (.64)	-.84

Table 5 (contd.)

Estimates of Two Simultaneous Equation Models with Years of Education and Number of Children as Dependent Variables (N=746)[1,2]

	Model 1				Model 2			
	Number of Children		Years of Education		Number of Children		Years of Education	
Variable	B (S.E.)	β	B (S.E.)	β	B (S.E.)	β	B (S.E.)	β
Years of Education	-.04 (.06)	-.06	--	--	-.04 (.06)	-.06	--	--
Constant	7.17		7.29		7.26		12.00	

[1] R^2 cannot be obtained when two stage least squares is used, however the exogenous variables explain .25 and .49 percent of the variance in Number of Children and Years of Education, respectively.

[2] Analysis based on a Sample with complete data on all variables.

*P < .05
**p < .01
***p < .001

The estimates of both specifications of the educational attainment equation indicate Talent women's educational outcomes are significantly affected by socioeconomic background, curriculum placement, peer influence and number of children. Model 1 also shows educational attainment to be enhanced by academic ability, however this finding is not replicated in Model 2, which includes the variable age at marriage. This suggests that academic ability does not influence years of education once differences in age at marriage are controlled. The direct effects of age at marriage on education are also found to be insignificant.

The standardized coefficients indicate that family size is the single largest determinant of these women's educational outcomes. The negative impact of children on women's educational outcomes appears to be even greater once differences in age of marriage are controlled. According to the estimates in the 2 models, each child costs a woman about .8-1.5 years of education. Thus, while women's level of education does not significantly influence family size at 28, family size appears to be the most important variable underlying women educational attainment.

Summary and Conclusions

Two-stage least squares analyses of the fertility-educational attainment relationship suggest that the

responsibilities of motherhood are an important factor attenuating women's educational achievements. On the average, each child was found to cost a woman about .8-1.5 years of education. The reciprocal effect of education on fertility was found to be statistically insignificant. Regarding the other determinants of women's educational attainment, this study's findings generally corroborate those of previous research. Contrary to Alexander and Eckland (1978) and Marini (1978), however, age at marriage was found to have an insignificant effect on level of education. Also, contrary to expectations based on human capital theory, adolescent expectations regarding age at marriage were found not to affect educational attainment. This may indicate that women give these expectations little weight in educational decisions. It is also likely that achievement expectations change over this time period and that those measured in eleventh grade do not reflect ambitions measured even a few years later.

The fact that number of children was found to be the single most important predictor of women's educational attainment may indicate several things. First, women with larger families may have lower expected returns to educational investment since they tend to spend less time in the labor force. They may, therefore, invest less in

education. Second, family size at age 28 may proxy lower career commitment and this may motivate lesser educational attainment. Finally, the results could be due to timing differences among women in how they integrate education and family formation. Some women may finish school before having children and others vice versa. If such a pattern exists, the results should change as the women age. Women who have delayed starting their families may ultimately have the same number of children as women who started childbearing earlier. Or, women who interrupted their educations in order to have their families may ultimately obtain the same levels of education as women who did not interrupt their schooling. In either case, the relationship between family size and educational attainment would diminish.

As is true of any study, a number of caveats apply to the findings reported here. First, the age of the sample was only 28. The women also had at least 11 years of schooling. Some results, therefore, may reflect relationships unique to samples of this age and level of education, such as individual differences in the timing of events.

Second, as noted earlier, the women in this sample were probably affected rather minimally by the feminist

movement. One might reasonably expect a different pattern of results with a later cohort of women due to substantial changes in factors such as the availability of child-care services.

Third, the explanatory power of the models indicates that important determinants of educational attainment are still unmeasured. Thus, the results are likely to change as models of educational outcomes are specified more comprehensively.

With these caveats in mind, the results of this study appear to suggest that childrearing responsibilities serve to deter the educational attainments of young women rather than vice versa. Thus, the trend toward postponing childbearing and/or having smaller families may well result in more women continuing their education beyond high school. In any case, future models of socioeconomic attainment should continue to explore the relationship between family and career outcomes.

Footnotes

[1]These studies report negligible or insignificant effects of marriage and family-formation variables on men's socioeconomic attainment.

[2]Waite and Moore (1978) analyze the influence of an early first birth on women's level of education at ages 18, 21, and 24. They argue that this design allows one to examine whether the effects of an early first birth diminish over time. Other variables in their model are race, occupational status of head of family of origin, mother's education, father's education, home culture index, intact family of origin, region of residence, parent-teacher help, parent's educational goal, high school curriculum, number of siblings, and age in 1968. Unfortunately, no measure of academic ability is included.

[3]These results should be considered rather tentative, since the same women are not included in the analyses at each of the three ages studied, i.e., the study is not truly longitudinal.

[4]Stratification was on the basis of geography (region and state), form of school control (public, parochial, and private), and, within public schools, on school size and retention ration (the ratio of the number of tenth graders in the school to the number of graduates). See Flanagan, et al., 1962, for more detail on sampling.

[5]Adolescent expectations regarding family size are not included in this equation because numerous analyses by the author (Abrams, 1980) indicated that this variable was unrelated to women's educational attainment.

[6]Waite and Stolzenberg (1976) suggest that having a large number of brothers and sisters creates a "taste for larger families," and lower SES families tend to have more children.

[7]See Duncan (1975) or Heise (1975) for a more detailed description of this method of analysis.

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